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Minerva Plaza - a new technology-rich learning environment

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Abstract

This article focuses on a new learning environment called Minerva Plaza that was opened in 2012 at the Faculty of Behavioural Sciences at the University of Helsinki. The purpose of the study is to find out how the new space has been used and received by the students, teachers and visitors, and to form a good overall picture of the strengths and weaknesses of the space as a technology-rich learning environment. Plans for the use of the space at Minerva Plaza are also discussed. The research is a case study where the Informant is a person who has worked as an educational technology coordinator at Minerva Plaza since it opened. One of the main goals is to make the most of the broad practical experience, insight, and theoretical knowledge that the Informant has about the use of the space.

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Keywords: technology-rich learning environment, educational technology, Minerva Plaza, learning space, University of Helsinki

1. Introduction

The challenge in today's schools is to be transformed into environments that encourage lifelong learning and equip the students with 21st-century skills and capacities. Global awareness, creativity, collaborative problem-solving and self-directed learning are some of the most important skills for the future and learning environments can have an important role in developing them. (Groff, 2013; Groff & Mouza, 2008; Yelland, 2007; Hannafin & Land, 1997; Riel, 1994). Furthermore, today's students, who are digital natives (Prensky, 2001) prefer a new way of

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learning and different kinds of learning environments. For example, studies have shown that learning environments that are equipped with proper technology can allow teachers and students to adopt new behaviours and responsibilities consistent with the realities of a rapidly changing technological society (McGhee & Kuzma, 2003).

It appears that the preparation of teachers in the educational uses of technology is a key component in almost every improvement plan for education and educational reform efforts (Thompson, Schmidt, & Davis, 2003; Gupta & Fisher, 2012; Latham & Carr, 2012). In fact, teacher education institutions have an important role in modelling the integration of technology and student-centred pedagogies for their students (Ertmer & Ottenbreit-Leftwich, 2010) by making it possible for them to experience these alternative means of learning and thinking (Gibson, 2005). Nowadays, most of the teacher education students are also digital natives and skilled at using technology in their personal lives. However, as teachers they also need to understand how technology can support and facilitate meaningful learning (Angeli & Valanides, 2009; Ertmer & Ottenbreit-Leftwich, 2010).

Technology is inevitably one of the main agents of educational change today. It has the potential to facilitate students to engage in interesting learning contexts (Bitter & Pearson, 2002). Many researchers have investigated different technological means to support more effective collaboration and knowledge creation (Hong, Chang, & Chai, 2014). By educational technology, refers to "artefacts that mediate deliberate learning" (Crook & Lewthwaite, 2010, p. 437). This means that technology is only a tool; tools are designed for a purpose and their effectiveness can only be assessed within the context of that purpose (Lajoie, 2005). Decisions about educational technology should be driven by teaching aims rather than the use of technology for its own sake (Laurillard, 2002; Latham & Carr, 2012). According to Sutherland et al. (2004), there is a tendency to think that information and communications technology (ICT) is so "new" that its use should be accompanied by "new" pedagogies that will somehow transform teaching and learning. This notion may be true, but general theoretical perspectives about teaching and learning, which are central to all teaching, with or without ICT, should not be ignored (Sutherland et al., 2004).

However, the research of learning with technology suggests that computer-related tools can actually facilitate constructivist-oriented teaching and learning (Kim & Reeves, 2007); however, the mere presence of computers or other tools guarantees the success of these kinds of practices (Jonassen, 2000; Schmid et al., 2009, Bitter & Legacy, 2008). In the end, the productive use of technology is dependent on the social organization of the learning activities (Rasmussen & Ludvigsen, 2010, p. 401).

1.1 Technology-rich learning environments

In this article, we see the learning environment as "a place or community where people have access to various resources they can use to be able to understand different things and develop meaningful solutions to different problems" (Wilson, 1996, p. 3). It also includes the social, psychological and pedagogical contexts in which learning occurs (Fraser, 1998). According to Groff (2013), many learning environments have looked to technology in their efforts to redesign teaching and learning. Technology integration has long been a key area of concern in education and the intersection of technology with the rapidly transforming educational landscape is profoundly framing the nature of technology in education in new ways (Groff, 2013).

Lajoie and Azevedo (2006) identify the most relevant principles for supporting the design of technology-rich learning environments (TREs) that enhance teaching and learning. Instead of reviewing teaching machines, they describe some of the theories of teaching and learning that can be applied to the design of effective TREs. According to them, technological advances in teaching and learning should always be designed based on a theory or model of learning and instruction, and meet the needs of learners. In fact, they define a TRE as a learning environment that is designed for an instructional purpose and uses technology to support the learner in achieving the goals of instruction. The way the teacher and the student act in these learning environments depends on both the purpose of instruction and the theory guiding the design of the TRE (Lajoie & Azevedo, 2006).

On the other hand, Garrick et al. (2013) use the term "technology-rich learning environment" (TRiLE) to describe technology paired with interactive teaching approaches. With this term, they "emphasize the necessary synchronization that must exist to balance and align the curriculum (content knowledge), instruction, and assessment (pedagogical knowledge) with the instructional technology features employed". They believe that for the results to be effective these components need to be synchronized and evaluated with thoughtful attention paid to the educational objectives and principles of learning (Garrick et al., 2013). The term 'technology-based learning

environment' is also used to describe these kinds of learning environments. In the broadest sense, it means the use of ICT in teaching and studying (Manninen et al., 2007).

The design of many of today's effective learning environments is guided by the principles of learning in context and learning by doing, constructivism, and situated and collaborative learning. As a matter of fact, learning in context facilitates meaningful learning, and it has long been said that if the students do not have the opportunity to apply the knowledge gained in school outside of the classroom, they will eventually lose it completely (Lajoie & Azevedo, 2006; Groff, 2013).

Furthermore, Lajoie and Azevedo (2006) state that well-designed technology-rich learning environments can couple factual knowledge acquisition with opportunities for applying such knowledge in specific problem-solving contexts. They can create realistic interactive environments in which learners will be able to construct new meaning from the instructional materials provided. The social aspect of learning in context is also a very significant theme. Learning communities where people learn from each other in social settings by observing the behaviours and outcomes experienced by others can help broaden knowledge by providing multiple perspectives, and TREs can support them by supporting community discourse and problem-solving activities. Actually, the technology itself can be the platform for learning, leaving teachers and experts free to observe and comment when students need help (Lajoie & Azevedo, 2006; Hannafin & Land, 1997). One might wonder where the individual fits in the social context. Since technology can be adapted to the way students learn and process information, TREs have the potential to capitalize on the notion of individual differences, as they have something that can attract everyone (Lajoie & Azevedo, 2006).

It is obvious that technology-rich learning environments are excellent platforms for improving and studying learning. In other words, they provide places to learn, teach and dynamically collect data about the learning process. Lajoie and Azevedo (2006) state that these kinds of platforms can provide a standardized curriculum and opportunities for students to explore material that they would not be able to reach in the regular classroom. TREs vary in the nature of the tasks they support and the kinds of competencies that they enhance, but all of them usually are designed to provide a meaningful context for learning new concepts and ideas and support the notion that the learner has some agency in interacting with the environment. Finally, they are also designed to support different types of knowledge and competencies and to be motivating through the tasks themselves or through social engagement in learning (Lajoie & Azevedo, 2006)

1.2 Minerva plaza

Minerva Plaza is a new, innovative engaging learning environment (ELE) located in the facilities of the Faculty of Behavioural Sciences at the University of Helsinki. Originally, the space was a reading hall of the university's library, but it was transformed into a modern learning environment during 2012 when the European Union designated Helsinki as a World Design Capital. It aims to support engaging learning methods, student-centred teaching and learning and the use of different kinds of educational technology.

Minerva Plaza is suitable for various types of events and methods, like group work, workshops, conferences, lectures and distance teaching. The space has a capacity for holding events for about 190 people and it consists of different smaller spaces that can be connected by distributing the same sound and picture to all of them. The smaller rooms are designed for tutorial groups and group work. One of them is also a prototype of what a future classroom will and could be. All the chairs and tables are removable. The glass walls enable everyone visiting the campus to see what is going on in the space. One of the walls is also removable which makes Minerva Plaza very flexible and easy to convert into smaller or larger learning spaces according to the needs of its users.

The space contains numerous iPads (32 to be precise) and every room has at least a SMART Board, which makes it easy to have a connection between different spaces of the plaza. One of the main uses of the SMART Board is for Flinga, an application from Finnish Nordtouch (http://www.nordtouch.fi/) that connects mobile devices (tablets, smartphones and laptops) to the classroom's devices (interactive whiteboards and projectors). The pictures and texts shared in Flinga can be seen on all screens in Minerva Plaza and everyone may edit the content. It is also possible to use Apple TV in the space. One of the new pieces of technology in Minerva Plaza will be CatchBoxes (http://getcatchbox.com/), which are throwable microphones that are designed to engage the audience in a lecture so that listeners can quickly ask and respond to questions.

2. Research design

This article covers research that was carried out interviewing the Informant about the use of Minerva Plaza and its technology. The following questions are discussed:

- What kind of users has the space had?
- How have they experienced it?
- What is the role of technology in the use of Minerva Plaza?
- What are the future plans for Minerva Plaza?

According to Flyvberg (2011), the most important factor in defining a study as a case study is the choice of the individual unit of study and the setting of its boundaries. The drawing of these boundaries determines what can be considered as a case study. Choosing to do a case study means choosing *what* is to be studied rather than *how* something is to be studied. The individual unit may be studied in very different ways. However, case studies usually comprise more depth than a cross-unit analysis (Flyvberg, 2011; Stake, 2005). In this study, we aim to understand the phenomenon through one case without trying to generalize. A case study can be chosen as a method when a researcher wants to understand a phenomenon deeply and explore its context (see Kvale & Brinkmann, 2009; Yin, 2009; Flyvberg, 2011; Bassey, 2000; Stake, 1995; Patton, 1990).

Case studies can be divided into three types depending on the nature of the case, the number of individuals counted as one case, the aims of the study and the basic assumptions of the case. It is called intrinsic case study when the researcher has a special interest in a certain case and wants to understand the case in detail (Stake, 1995). We wanted to know how the new learning environment, Minerva Plaza, has been received and used as a technology-rich learning environment. To achieve this, we decided to have Mikko Halonen, the educational technology coordinator of the space, as the Informant. He has worked in the space almost daily right from the start and probably has the best overall picture of the use of the space. Halonen was originally a classroom teacher, which also makes him competent to comment on the pedagogical principles behind the design of the space. When interviewing the Informant, we especially wanted to hear his opinions and experiences of the use of Minerva Plaza and its technology.

The interview was conducted in the summer (4.6.2014) at the Minerva Plaza itself and it lasted a bit over two hours. In the summer 2014, the Informant has read and corrected the text of this article making valuable remarks and improving a few details. Thus, the reliability, meaningfulness and validity have been improved.

3. Findings

3.1 The users of Minerva Plaza

Minerva Plaza was originally designed and reformed for the use of the Faculty of Behavioural Sciences. A reading hall of a library was transformed into a learning environment where there the faculty could have lectures and tutorials. However, today it has a much wider user group, and many guests outside the faculty and the university come to organize events in Minerva Plaza. The Informant, Mikko Halonen, has a unique view on how the space has been utilised by different types of users.

> We get feedback from all the users. They have given us all sorts of suggestions for how to develop the space and its educational technology. . . . There's constantly small suggestions about what apps to have on iPads or what kind of furniture could be added in the space—these arebasically ideas and questions that come up when people are using the space. (Halonen, 2014)

3.1.1 Students

Today Minerva Plaza is being used by numerous students, but this wasn't always the case, according to Halonen:

At first, the space wasn't available for students on their own time, but they did give us some negative feedback about that and I decided to find out if it could be possible for them to come and spend time in Minerva Plaza without

making any reservations for it when I'm around. For me, it's really important that it has been possible this whole academic year. It's also important because then they can come here and work with their projects, use the technology and get better at using them all at the same time.

Generally, the students have been excited about using the space. There are already some student groups that come regularly to work on their own time to do their school projects and assignments. Yet, the Informant reports that sometimes his presence might prevent students from coming to use it:

> To some extent, my presence here makes the students feel that they have to ask permission to use the space. They might say, 'Can we use the SMART Board?' or 'Can I move this table or this chair?'. My answer is 'Of course you can! That's what the space is made for'. On the other hand, nowadays some active student users of this place don't even ask if they can make changes here; they just come in, say hello and start building their learning laboratories. That's great! (Halonen, 2014)

According to Halonen, the student's feedback has been mainly positive since they have been able to use Minerva Plaza freely. Many have felt that the space is motivating and makes them learn better and in a deeper way. He stated that there are number of students who have become enthusiastic about the possibilities of the space and asked for a course from which they could learn the technological skills needed for the use of educational technology. This can be seen as a positive outcome because often teachers do not know how to use the technology or teach about it, and such a course would be an opportunity for students to learn directly about using the available components (Groff & Mouza, 2008; Bingimlas, 2009; Lawless & Pellegrino, 2007). Halonen noted:

> Students sometimes express their concern about the fact that they don't know how to use these tools that we have here and that they are not being taught how to use them. When I have received this kind of feedback from the students, I've encouraged them to ask the teachers to include these tools in their teaching. I think it has worked. The students have demanded it and the teachers have listened to them. For example, we have realized a project here where the students planned a whole learning unit designed to be implemented here in Minerva Plaza and carried it out for their fellow students. This way they actually perform and try new skills with the space and use it in their own teaching. (Halonen, 2014)

There is also some feedback that has not been mentioned, but can be and has been seen by the Informant when he has followed students during the lectures: students do not always want to assume more responsibility.

> The students are given much more responsibility in learning and their role has changed from listener to producer. Sometimes, when the students are busy with their assignments and other responsibilities, they have wanted to be less active, to remain inactive, sit back and just listen and be on Facebook and maybe catch up with their studies a bit later. (Halonen, 2014)

To conclude, according to the Informant the students of the Faculty of Behavioural Sciences have liked the new space and the changes it has brought to teaching and learning at the university. It takes time to adjust to these new ways but the atmosphere has been mainly positive and excited. Many student teachers have actually got excited about the new technologies.

The teaching culture in the universities is changing. For example, effective use of technology usually requires substantial changes in classroom routines, and that can produce anxiety and concern (Bitner & Bitner, 2002). The greatest upheaval is going to be the change in the roles of teachers and students. The Informant acknowledged that this transformation does not happen overnight. Both students and teacher need to have time to adapt to these new practices and adopt their new roles (e.g., Rasmussen & Ludvigsen, 2009).

3.1.2 Teachers

Although Minerva Plaza is in active use, Halonen wishes that more teachers would dare to come to teach there and take advantage of what the space has to offer. However, as said before, adopting new spaces and new methods takes time. He summarized:

> Not everyone wants to come to an aquarium-like space like this. Anyone can see what's happening in the Plaza, especially in the centre square, from all the rooms around it and from all the floors in the building. For many it is a big step to come and teach here. The smaller spaces around the main square that aren't that visible for everyone seem safer for some teachers and at first they have started teaching there. However, people also tell me that they get used to being seen by everyone. Many people come here regularly to look through the glass to see what's happening here and sometimes they have come to ask what we were doing and whether they could use that in their own work. Well, I mean, of course not everyone is interested in the use of the space and not everyone wants to teach this way, be it justified or not. (Halonen, 2014)

According to Halonen, another issue that prevents teachers from coming to Minerva Plaza is that some of them have so much material of their own that carrying it there would be difficult. However, some teachers use the space very actively and already cope well without the help of the teacher on site, in this case the Informant. These active users are the key persons who are developing the space and the methods used there.

The teachers' role is also about to change radically in the future. The students will be given more responsibility and the teachers will no longer be the high authorities who distribute knowledge. McGhee and Kozma (2003) identify six new roles for teachers in a technology-supported learning environment: instructional designer; trainer; collaborator; team coordinator; advisor, and monitoring and assessment specialist. These six tasks quite well the change in the role of teachers. When teachers have to move between being instructors and connectors of different activities, their roles can become even more complex than before (Rasmussen & Ludvigsen, 2010). Halonen has also seen this change when he has followed the lectures held in Minerva Plaza.

> Someone might ask whether we need teachers anymore in a space like this, but this space doesn't negate the need for teachers. The use of the space does easily change teachers' roles, but they are definitely still needed, maybe even more than before. In a way, teachers are at the mercy of the students here because they can't really predict what the students will bring up. Then teachers just have to be able to navigate and direct the learning process. Therefore, they kind of give away their authority or at least some of it and give the power to the students, so I see it is more challenging for teachers in a space like this. (Halonen, 2014)

The transition from an industrial to an informational society has brought changes to the methods of acquiring knowledge and processing it productively. Moreover, education has to be able to answer to the new needs of the future citizens (Taylor & Hogenbirk, 2001). Any change in educational practices must begin with the teacher education institutions and their students. The future teachers will have to be capable of building rich learning environments filled with opportunities for authentic, project-based and collaborative tasks as well as a pervasive access to technological and non-technological tools (Bitter & Legacy, 2008; Mishra, Fahnoe, & Henriksen, 2013). Halonen sees that the teacher education also has a crucial role to play in developing teaching practices and modelling them for the future teachers. The Faculty of Behavioural Sciences, whose expertise has to do with teaching, learning and pedagogy, has to teach what it preaches and introduce new kinds of learning environments to students and demonstrating them could have a massive impact on how they will organize their teaching in the future.

> In my opinion, we should teach student teachers, especially primary school student teachers, in this space because they have to have the ability to use different kinds of educational technology in their work. If they don't see how they can be used correctly during their studies here, they will have a much more difficult time learning to use educational technology in the field or in their future classrooms. (Halonen, 2014)

In fact, Halonen notes that if the faculty's own staff doesn't take advantage of the space in a sensible way, other faculties will be given the chance to use it even more because the main idea in the space is to use it and its technology to teach in way that answers to the goals of the space.

As we can see, getting people to use a new learning space in a way that it is designed to be used is not unproblematic. However, during the two years Minerva Plaza has been in use its user group has got bigger and more diverse.

3.1.3 Other Faculties' and visitors' use of Minerva Plaza

Aside from faculty from Behavioural Sciences, other faculty members have also used Minerva Plaza. Halonen sees this trend as positive as the best new teaching methods and models can naturally transfer outside the Plaza and the education faculty to other campuses and faculties. Visitors who come from outside the university are also welcome to Minerva Plaza. One of the strengths of the space is its flexibility and adaptability, which makes it possible for educators to organize all sorts of events there. Halonen noted:

> We can have tutorials in one space in addition to a lecture on the main square and visitors from Austria in another space getting to know the Finnish education system, as we had today. Therefore, we can have all different activities going on here at the same time. Alternatively, the whole plaza might be used for just one event. Conferences are good examples of this and the plaza is usually reserved for them for the whole day. They usually have the normal keynote speeches in the main square and after those, presentations of individual papers in the smaller spaces. Afterwards, everyone returns to the main square to discuss what has been seen and presented. (Halonen, 2014)

Halonen states that what prevents the effective use of the space is that people do not usually know what the space actually has to offer. One part of his job as an educational technology coordinator is to help visitors as well as the teachers and other staff of the university to make an effective plan for teaching or lecturing in Minerva Plaza.

> . . . sometimes they [visitors] make reservations for the space just through the internet page and although we advise everyone coming here to contact me beforehand, they don't always do that. This means that when they come here in the morning I just ask what they want to do and tell them what kind of tools we have here. Sometimes some are very eager to try them out, but usually they have to come here again and then we can start trying something new. Often when we have different companies or businesses visiting here, we just use Flinga, which makes it easier for the audience to send in questions. There have been times when they have used SMART Boards during group sessions. . . . My wish is that the users, especially when they come here for the first time, would come to plan with me what to do so that we together could think about what operations models could work because in the end, technology is just technology and without any sensible pedagogical plan, it is just a waste of time. (Halonen, 2014)

According to Halonen, most of the experiences with visitors, like companies or people coming to conferences, have been positive. The feedback has been mainly good and some of the visitors have also made suggestions for making even better use of the space and its technology.

3.2 The role of technology in Minerva Plaza

According to McGhee and Kozma (2003), technology's most important task is to provide students with tools and information that support their problem solving, communication, collaboration and knowledge creation. This list of tasks also came up in the Informant's answers. When we first started to plan the interview, questions especially about technology and its use in Minerva Plaza sprang to mind. Those questions were asked and answered, but the Informant told us right at the beginning of the interview that the focus is always on pedagogy. As already mentioned, Halonen thought that instead of emphasising the use of technology, they should focus on pedagogy and educational technology should be only seen as a tool for learning and activating and engaging students (cf. Clark, 1994), but it has taken time even for Halonen and the active users of the space to realize this. He reflected on the process:

> I think that at first we didn't have a clue about how everything worked here, but we were awfully excited. It was more about us learning, trying and finding out together with the students what are the good practices and methods for the space. At that point, our excitement was the most important thing. Now our most active users have a lot of expertise and they are still very enthusiastic about the space and especially about their subject. So the devices that we have here are now somewhat in the background and here just to support and enable learning. Maybe during the first year the technology was given too much attention, but we were still practising back then. I actually consider this second year the first real year of the proper use of

> the space because we have now known how to use the space effectively and in a way that it is really designed to be used. (Halonen, 2014)

During the interview, Halonen emphasised that the idea of the construction and transformation of Minerva Plaza came from pedagogy and its research, not from technology. In fact, Halonen stated that he was happy that after the first year the emphasis on technology has reached the level where it should be. He noted that he would like the technology to be less and less visible so that it would be just one aspect of teaching.

3.2.1 Pedagogy first

According to Halonen, currently new learning spaces and environments are designed to be adaptable and flexible so that the goals of teaching define the way the space is organized, not the other way around. Lonka (2012), who claims that it is extremely important to take into account modern theories of learning when designing new learning spaces, supports his ideas. For example, the design can aim to enhance the principles that are involved in collective processes and products (Rasmussen & Ludvigsen, 2010). That is what has been done with Minerva Plaza as well. For example, an auditorium already determines what can and what cannot be done in it, but in Minerva Plaza, there are tables and chairs that can be easily moved, even taken away to make room for a drama or dancing lesson. Halonen states that this kind of adaptability is one of the key factors of a multi-use space.

One of the main goals behind the design of Minerva Plaza is to change students' roles radically. The previous chapter mentioned how students have reacted to the university's attempt to activate and engage them during the lectures and other teaching sessions (see also Lonka& Ketonen, 2012). One of the pedagogical solutions for this has been the use of problem-based learning methods. In the following quotation, Halonen describes this method of working in Minerva Plaza. The role of the technology is once again quite small.

> . . . A lecture begins with an introduction to the theme after which the students are activated and given an assignment or a problem to solve. Then they will work mostly in small groups solving the problem, discussing the theme and trying to condense their ideas. Only after that will they use these tools to share their ideas with the rest of the group on screen where the whole group can see what they have produced. That's where they could take the next step in developing and refining their ideas. This could be the ideal way to use the space; of course, there are different ways a person could teach here, but the point is that we make students engage, actively take part in teaching and get excited. (Halonen, 2014)

The technology itself can motivate and engage students (Nelson Laird & Kuh, 2005), but this does not apply to all students in the university. Halonen notes that he has met students who still regard technology as something negative and at that point, it is the teacher's job to know some techniques to get them engaged in learning with technology. Once again, the pedagogy is the key to successful teaching and engaging learning (e.g., Ravenscroft, 2009; Clark, 1994).

Some other principles behind the pedagogy of Minerva Plaza, according to Halonen, are collaborative learning and co-construction of knowledge. In addition, the space is designed to inspire "Trialogues", which means that interaction through "shared objects" that are in the process of being developed is emphasized. These objects of inquiry can be knowledge artefacts, practices or ideas, but they are understood as something concrete that is being developed collaboratively (Paavola & Hakkarainen, 2009).

Halonen explains that many new technological applications available in Minerva Plaza have been first and most tested in the arts and skill educational studies. Two recent projects that have been developed in Helsinki illustrate his point: the Bridges of Joy project and the arts teaching project at Ateneum, the Finnish national art museum. In the Bridges of Joy project, student teachers together with the preschool and primary school children created animated films for and with hospitalized children. During the project, children created their own stories and made animated films from them. The films were shared through DVDs and a Vimeo page (see http://vimeo.com/channels/ilonsillat).The theme of this project was Bridges of Joy and its purpose was to bring joy to and connect children from different learning environments. In this arts educational project, new learning technological applications and techniques, like iPads and social media were used and combined with an integrated collection of children's stories, visual arts and sound colours made of instruments and human voice (Ruokonen & Ruismäki, 2013). At an Ateneum arts educational project and pre-primary school arts educational studies visual

thinking strategies which is an inquiry-based teaching strategy was combined to the augmented reality by the Aurasma application. The results show that the collaborative design learning methods fit very well into integrated arts educational studies, as does the use of modern technological applications even with very young children.

Halonen reported that there has also been talk about the 'flipped classroom', which means that the basic knowledge is acquired before the lesson from different kinds of sources, such as books and videos. When the students come to the lesson, everyone has the same basic understanding of the topics, which helps them to start putting the new knowledge into practice and solving the problems presented in the lecture. These kinds of 'flipped' lessons consist of discussion and group work. The idea is that the valuable time that is spent together with other students is not used for listening to the teacher deliver basic facts, but rather finding out the answers together and applying the information when solving the problem (Phillips & Trainor, 2012; Bergmann & Sams, 2012; 2014).

3.2.2. Technology as a good second

Although the use of technology is not the first priority in Minerva Plaza, there is no denying that new technology has brought about some new, exciting and impressive opportunities for teaching and learning. There also appears to be a strong positive relationship between using information technology for educational purposes and involvement in effective educational practices such as collaborative learning (Nelson Laird & Kuh, 2005).

Halonen has stated that the greatest strength of the technology in Minerva Plaza is that it makes sharing information very easy and lowers the bar for students and teachers to participate during the teaching sessions. Thanks to ICT, it is now much easier to search for and organize information, analyse data, represent ideas, and communicate with others in ways that were not practical or even possible previously. The right kind of learning environments can also provide new opportunities for teachers and students to break out of old roles and patterns using technology (McGhee & Kozma, 2003). Flinga, for example, has been used effectively almost daily. According to Halonen, it gives even the quieter students a chance to speak up and give their opinion. He also finds the anonymity of Flinga very interesting; students can send their questions and opinions to the big screen without having to stand up or speak in front of others.

> It [technology] enables the teachers to have these tutorial-like moments even during the large lectures. With the help of Flinga or Apple TV, the products of these moments can easily be brought, to the screen where everyone can see them. . . . People possess a lot of knowledge and expertise that they don't necessarily reveal, but if they talk in small groups at first, then maybe they can dig deeper and find out what students already know about the theme at hand and what kind of new ideas they have about it. The fact that information can be shared in this new way with everyone is one of the greatest strengths here.

Another strength of the educational technology that Halonen mentions is the possibility to use it as a medium for producing different kinds of artefacts. He says that he does not quite understand why everything that is being produced should be in a form of a text and gives examples of how student's productions have been made in the form of videos and multimedia presentations in Minerva Plaza. He also mentions wikis and blogs, which, according to Hemmi, Bayne and Land (2009), have significant potential as new collaborative and challenging environments for formal learning. Overall, Halonen sees that technology successfully supports teaching and learning that takes place at Minerva Plaza. He states that it does sometimes enable the use of methods and ideas that would otherwise be quite impossible to put into practice.

> Well, technology makes it easier to communicate and interact when we have many people here; for example, there were 170 people here doing problem based learning in smaller groups. So then, it is possible for the teacher to connect with people in different spaces and to give them stimuli when he or she sees that they need them. Of course, the teacher can also just walk into the room when he/she sees that the group is stuck or deadlocked, but she/he could equally just send them some sort of audio-visual stimulus. (Halonen, 2014)

3.3 The future Minerva Plaza

One idea behind Minerva Plaza, among others, is to present an example of a new learning environment for

student teachers. That is why it has to keep up with new pedagogies and educational technologies. However, it is important not to treat all ICT tools as unproblematic innovations that will enhance learning and replace the older, working technologies (Sutherland et al., 2004). According to Halonen, Minerva Plaza is actually a living laboratory where innovations in pedagogy and technology are constantly being tested. Only the ones that work will be adopted.

On a pedagogical level, the future goal is to put the methods now used in Minerva Plaza more widely into practice at the faculty and on other campuses. Nevertheless, there have been discussions about taking new technologies, like robotics, into the plaza's repertoire. The use of "flow walls", which will show the level of flow the people are in when working in Minerva Plaza, will be researched for possible use in the future. As for CatchBoxes, they will make it easier to have conversations in large groups and they resolve the acoustic challenges that Minerva Plaza has because of its high ceiling. There are also plans to use these microphones in different kinds of game-like activities. As can be seen, there are many interesting innovations to come. However, they are not all necessarily technological. One of the new objects in the plaza will be a large whiteboard wall on which students can draw and share their mind maps. However, Halonen noted that there are still issues that need to be further examined in the future:

> One of the future targets of development is virtual learning environments. In my opinion, they are quite stiff still and need a lot more attention. Now the university mainly uses the Moodle platform which works pretty well, but I still find the gap between the learning happening in and outside the campus too large. The transition between them isn't very smooth yet and what can be done in the virtual learning environments is still quite limited. However, there are all sorts of learning environments being designed as we speak. I haven't seen a (virtual) learning environment that fulfils all of our dreams, where students and teachers could smoothly continue the learning process that was started here at the university. (Halonen, 2014)

Halonen also has many different ideas about how the space could be expanded and used to support more informal learning. Overall, he would like to see more creating and innovating happening in Minerva Plaza.

> Well, the space doesn't yet work as an informal learning environment as much as I would like it to work. I would like to see more self-directed student groups taking advantage of the space's possibilities so that during their studies they would create something incredible here. Maybe someone could invent a new use for the space.
>
> I would like to see the space being used in a more informal way when it could be also more like a laboratory. Maybe it could be more like a cafeteria with little corners where students could try out different ideas. We could bring the companies here, maybe do different projects with them, and invent new ways to utilize the educational technology. We could offer an environment where the staff and the students could create innovations. (Halonen, 2014)

One clear development in the future is making the idea of Minerva Plaza more transferable. This will happen in the fall of 2014 when a "mobile plaza" will be instituted. It is a rather small trolley that can be easily moved from one place to another and has 12 iPads, a teacher's computer, an Apple TV and almost all the applications, programmes and functions that are available in Minerva Plaza. With the trolley, it will be possible to take the technology of Minerva Plaza out of the space without having to equip other rooms with it and use the devices in any other place on the campus or the faculty. It is designed to be as easy as possible to use. Students or teachers will just have to know how to turn on a computer or an iPad and the tools will be ready to use.

Halonen thinks that the space will never be ready. There are always some innovations that need to be tested and adopted. In fact, one of the main principles behind the plaza is that it will never stop evolving. Currently, several ongoing projects at the Faculty of Behavioural Sciences are investigating new kinds of learning environments and technologies. For example, the OmniSchool project is looking into opening learning environments and seeks to develop a new scholarly, research-based thinking to build future education (http://omnischool.fi/research/) and the "Mind the Gap" project is examining different kinds of gaps or discontinuities between the minds of adolescents in the digital age and prevailing educational practices (http://wiredminds.fi/projects/mind-the-gap/).

4. Conclusion

Technology-rich learning environments are the learning environments of the future. The fast pace of the development of educational technology brings new possibilities to the field of education, and the use of technology in education will have an important role in providing students with the skills needed in the 21st century.

From the interview with Mikko Halonen, the educational technology coordinator of Minerva Plaza, it can be concluded that this new space has worked well as a technology-rich learning environment and so far answered to the needs of the 21st-century students and their teachers. The feedback of the users has been mainly good, but there are still improvements to be made. As mentioned before, one of the strengths of Minerva Plaza is its adaptability. This should make it easier to face the future challenges of new pedagogies. According to the Informant, the technology is often used in Minerva Plaza, but it usually only works as a tool for enhancing learning. Pedagogy and students should still be at the centre of teaching and learning, whether or not the learning environment is equipped with technology.

This means that systems of education do not necessarily have to leverage technology to improve and advance, but there are several key drivers pushing technology as a key component for the change. Emerging technologies are provoking a re-conceptualization of teaching and learning and great advances in educational technology have inspired new ways to engage students in many different ways (Groff, 2013; OECD, 2010a; 2010b). For example, Minerva Plaza has offered a creative arts pedagogical "test laboratory" especially for the arts and skills educational studies and new collaborative design learning solutions.

It seems that often technology can offer the most sensible mediational route for desired learning outcomes (Crook & Lewthwaite, 2010). That is why innovations in pedagogy and educational technology are being tested all the time in Minerva Plaza, and many new tools are on their way to becoming part of the Plaza's arsenal of technology. The construction and use of technology also requires construction of meaning which only evolves in everyday practice (Lipponen, Lallimo & Lakkala, 2006). Pedagogy and technology never stop evolving and because of that neither does Minerva Plaza.

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Videos about Minerva Plaza and its use:

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http://vimeo.com/channels/minerva/80450165

http://vimeo.com/channels/ilonsillat